Lake Huron Invasive Species Surveillance and Nearshore Fish Community Monitoring Protocol

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The U.S. Fish and Wildlife Service, Alpena Fishery Resources Office (FRO) in Alpena, Michigan is conducting surveillance to detect new populations of invasive fish species and to monitor existing invasive populations in ports and rivers of Lake Huron and the St. Marys River. These efforts are also targeted at monitoring the effects of invasive populations on existing fish communities. Two invasive fish species are targeted, the Eurasian ruffe (*Gymnocephalus cernuus*) and the round goby (*Neogobius melanostomus*), however information is collected and voucher specimens are retained for all invasive fish species captured.

Background

In the 1980's the Eurasian ruffe (ruffe), a percid, was introduced from the ballast water of ocean-going freighters and established populations in western Lake Superior. Ruffe were first found in Lake Superior at Duluth Harbor, where they became very abundant. Their range began to spread within Lake Superior and raised concerns within the Great Lakes Fishery Commission. Therefore the Commission organized a Ruffe Task Force in 1991 to determine the threat of ruffe in the Great Lakes. Ruffe were decidedly a serious threat to the fisheries of North America and were designated an "aquatic nuisance species" in 1992 by the Aquatic Nuisance Species Task Force. The ANS Task Force appointed a Ruffe Control Committee in that same year to develop a control program.

In 1992 the U.S. Fish and Wildlife Service, Ashland FRO in Ashland, Wisconsin initiated a ruffe surveillance program in the Upper Great Lakes. Efforts were targeted at locating new populations of ruffe at ports and large rivers within the Upper Great Lakes. Bottom trawling gear was used to sample preferred ruffe habitat, consisting of disturbed channels of deep, dark water. Initial surveillance efforts in Lake Huron targeted five locations from Port Dolomite near Cedarville, Michigan to Thunder Bay in Alpena, Michigan. In August 1995, two ruffe were captured from the Thunder Bay River in Alpena, and in 1996, the lead for ruffe surveillance efforts in Lake Huron was passed to the Alpena FRO in Alpena, Michigan.

Surveillance efforts in Lake Huron were expanded southward to the Saginaw River in 1997 and in that same year round goby was first detected. Surveillance efforts were renamed to accommodate and document the spread of the round goby in Lake Huron and all invasive fish species. In 2000, invasive species surveillance efforts were expanded north into the St. Marys River. Currently a total of eighteen locations have been sampled (Figure 1) from the head of the St. Marys River in Sault Ste. Marie, Michigan to Harbor Beach in southern Lake Huron. Seven locations are sampled annually (circle) and eleven are sampled infrequently (triangle), as funding and time allows.

By 1995 the Ruffe Control Committee had developed a Ruffe Control Program for the Great Lakes. The sampling objectives and procedural protocol for invasive surveillance in Lake Huron and the St. Marys River is outlined in this document and conforms to the Ruffe Control Program as revised in 1996.

Objectives

Objectives of the Lake Huron invasive surveillance program are to:

1. Conduct surveillance sampling in likely locations to find newly established invasive species populations in Lake Huron and the St. Marys River
2. Monitor existing populations of invasive species in Lake Huron and the St. Marys River to determine status and trends,
3. Monitor existing nearshore fish communities in Lake Huron and the St. Marys River to detect impacts of invasives on affected fish communities, and
4. Educate the public about the concerns associated with invasive species, and alert them to methods to prevent unintentional range expansion and educate them on how to identify and report invasive species they encounter.

Sampling Procedures

Invasive surveillance is conducted in August to October in nearshore waters associated with ports and rivers in Lake Huron and the St. Marys River. In addition to fall surveillance, nearshore spring surveillance is conducted with alternative gear within Thunder Bay during April and May. Sampling locations were established based on historical surveillance locations, ports that accommodate freighters that may transfer ballast waters, reports of invasive sightings, proximity to existing invasive populations, and difficulty of sampling.

Eighteen locations have been sampled in Lake Huron and the St. Marys River (Figure 1). Seven (circles) are sampled annually, weather permitting. Eleven (triangles) are fished infrequently due to budgetary and time constraints.

Sampling Gear

A 4.9 m bottom trawl is the primary gear used to sample for invasive fish and to monitor the nearshore fish community in this survey. A minimum of 30 minutes total effort is targeted per trawling location. When necessary, alternative gear, including 3.0 m bottom trawls, small-mesh gillnets, small-mesh traps, and/or electrofishing, is employed when the 4.9 m trawl cannot be used. Specifications on the gear type and protocol follows:

Bottom trawl

A 4.9 m fully-rigged semi-balloon bottom otter trawl (3.81 cm stretch body and 0.84 mm cod mesh) with 38.1 x 76.2 cm otter trawl boards is the primary gear used in the survey.

Protocol

The following step-by-step protocol is followed:

1. The trawl is inspected for holes and all couplings (between the net and otter boards, boards and bridles, and bridles and line, and the retrieval buoy) are checked to be sure they are secure. The cod end of the net is tied to prevent fish from escaping.
2. The trawl is deployed from the side of the boat while in mid-turn such to prevent the net from being drawn into the motors and taking care to avoid twists between the trawl boards and net and the net and retrieval buoy.
3. Once the net is correctly aligned, the cable is let out and the boat straightened at idle speed. A short burst of speed is given when the trawl boards gain contact with the water to allow them to spread apart, thereby opening the net. The boat speed is returned to idle and the remainder of cable is deployed at a ratio of 3-4 times the water depth. (Marks on the cable show the length deployed.)
4. Once the net and cable is deployed, the following data is recorded: date, start time, start coordinate, water depth, and surface and bottom water temperature. A stopwatch is

started to record the length of the tow, and the boat is then accelerated for the desired length of the tow (generally 5 minutes – however this can vary).

5. At the end of the tow, the end time, end coordinate, and water depth are recorded and the stopwatch is stopped.
6. The cable and net are then retrieved.
7. The net is shaken down to the cod end, which is opened and the catch is emptied into a basin of water. The catch is sorted by species.

Target (invasive) species: Target species include all invasive species – mainly Eurasian ruffe and round goby, but include white perch, three spine stickleback and others. Total length and a group weight are recorded for 25 random specimens. The remainder are counted and weighed. Aging structures (otoliths, dorsal spines, or scales) are removed from 5 specimens per 1 cm length class. A voucher specimen is retained in alcohol and labeled from areas where new sightings occur.

Non-target species: Total length is recorded for 15 random specimens of each species and the remainder is counted. For large catches of a single species, a weight is established for 25 specimens and the remainder is weighed to predict the total number based on average weight. When a species is not readily identifiable, a voucher specimen is retained in alcohol and labeled as an unknown for identification back in the lab.

All invasive species are retained and disposed of and all non-target species are returned to the water alive when possible. The catch is abandoned when a loss of fish may have occurred or when the gear was not fished properly. Examples would include when the trawl is snagged to a complete stop for any period of time, when holes are discovered in the net upon retrieval, or when the net is not fished properly because the boards have twisted. Neither the effort nor catch is counted in these cases. A minimum of 30 minutes total effort is desired per trawling location, usually requiring six, 5 minute tows.

Alternative Gear

When bottom trawling with a 4.9m trawl is not feasible, alternative gear is used to detect invasive species and to document the existing nearshore fish community. Alternative gear includes 3.0 m bottom trawls, small-mesh gillnets, small-mesh traps, and electrofishing. The catch is processed in the same way as for bottom trawling stated above.

Bottom trawl – 3.0 m: A 3.0 m semi-balloon bottom otter trawl (3.81 cm stretch body and 0.84 mm cod mesh) with 30.5 x 60.9 cm trawl boards is an alternative gear that is smaller, yet fished in the same way as the larger gear only by hand and with rope instead of cable. It is used in shallow and smaller areas that have an even bottom, including bays and small river mouths. Effort is recorded in minutes trawl was fished and would consist of six 5-minute tows for a total of 30 minutes effort per sampling location.

Gillnets: A 30.5 x 1.8 m small-mesh gillnet (3.81 cm stretch mesh mono-filament) paired with an 37.5 x 1.8 m experimental gillnet (7.5 m panels from 3.8 to 10.1 cm stretch mesh multi-filament) is an alternative gear used with un-even bottoms where trawling is not feasible, such as over cobble substrates. Gillnets are anchored and fished overnight, perpendicular to shore. Effort is recorded in nights gillnet was fished and would consist of one night each for paired placement of one small-mesh and one experimental net at each sampling location.

Small-mesh beach seine: A 30.5 x 1.8 m small-mesh beach seine (1.3 cm mesh) is an alternative gear used with shallow even bottoms –generally near small river mouths, where trawling is not

feasible. The seine is pulled through the water in an arch to capture shore dwelling fish. Effort is measured in seine hauls and would consist of two hauls per sampling location.

Minnow traps: Minnow traps are anchored, baited with worms and fished overnight near structure where fish would hide or feed. Effort is recorded in trap night and would consist of 1 night with 7 traps for a total of 7 trap nights effort per sampling location.

Electrofishing: Boat boom electrofishing with 360 to 580 V pulsed DC at 8 amps is an alternative gear used in shallow water over un-even bottoms where trawling is not feasible. Effort is recorded in minutes electrofished and would consist of 30 minutes effort per sampling location.

Data Measurements

The following abiotic and biotic data measurements are recorded for all surveillance efforts.

Abiotic data

- Project code, Station code, and Location
- Lake Statistical district and Lake grid
- Crew initials and Vessel name
- Gear code and Effort
- Date, Time set and Time lift
- Set and Lift Coordinates in Latitude and Longitude (recorded with GPS)
- Set and Lift Water depth (m)
- Substrate description
- Surface and Bottom Water temperature (°C)
- Light and Wind/Wave speed and direction

Biotic data

- Species code
- Total length (mm)
- Weight (g)
- Scale/Spine/Otolith identification number (see *Target Species*)

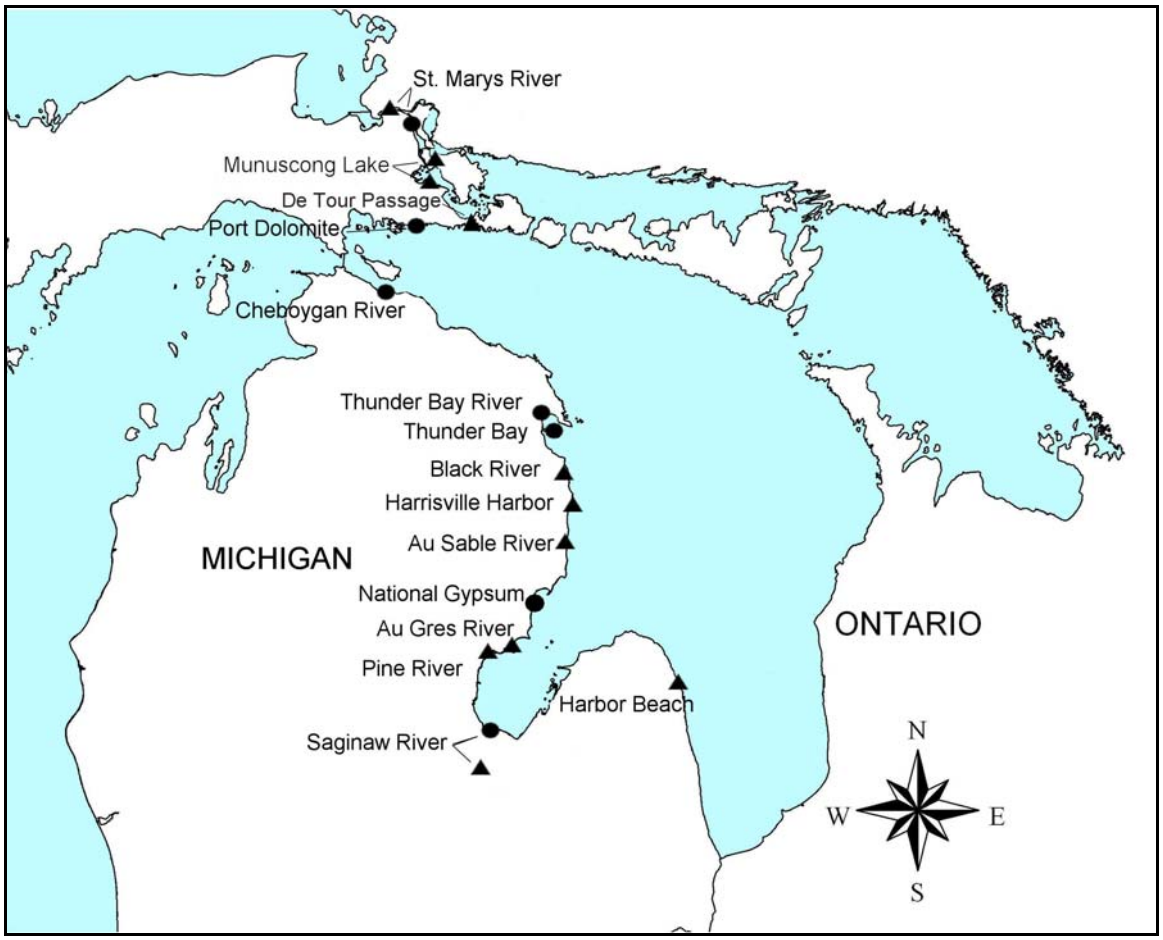

Figure 1. Sampling locations for invasive species in Lake Huron and St. Marys River.